Slide Deck:
Dealing with Crises in Urban Transport Systems

Transformative Urban Mobility Initiative | March 2025

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

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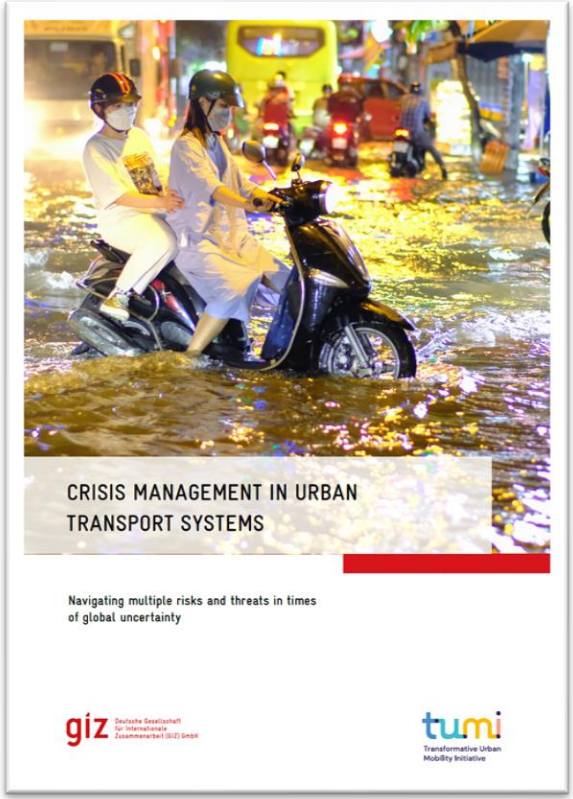
About

This slide-deck complements the publication „**Crisis Management in Urban Transport Systems“**, published by GIZ under the Transformative Urban Mobility Initiative (TUMI).

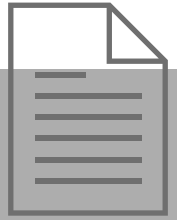
Download in the TUMI Knowledge Hub:

https://transformative-mobility.org/multimedia/crisis-management-in-urban-transport-systems/



Content

1. Study context



In view of multiple crises affecting fossil fuel dependent urban transport systems, the study aims to outline strategies and measures to build resilience

Background

- The accelerated pace of multiple crises, such as COVID-19, Russia's attack of Ukraine and the climate crisis is confronting urban transport systems with unprecedent impacts
  - Strong variation in fuel supply and demand
  - Volatile energy prices
- At the same time the sector needs to undergo a fundamental transformation to cope with the climate crisis
  - Decarbonising and phasing out of fossil fuels
  - Investing in renewable energy sources and building resilience for climate risk

Dealing with fossil fuel crisis

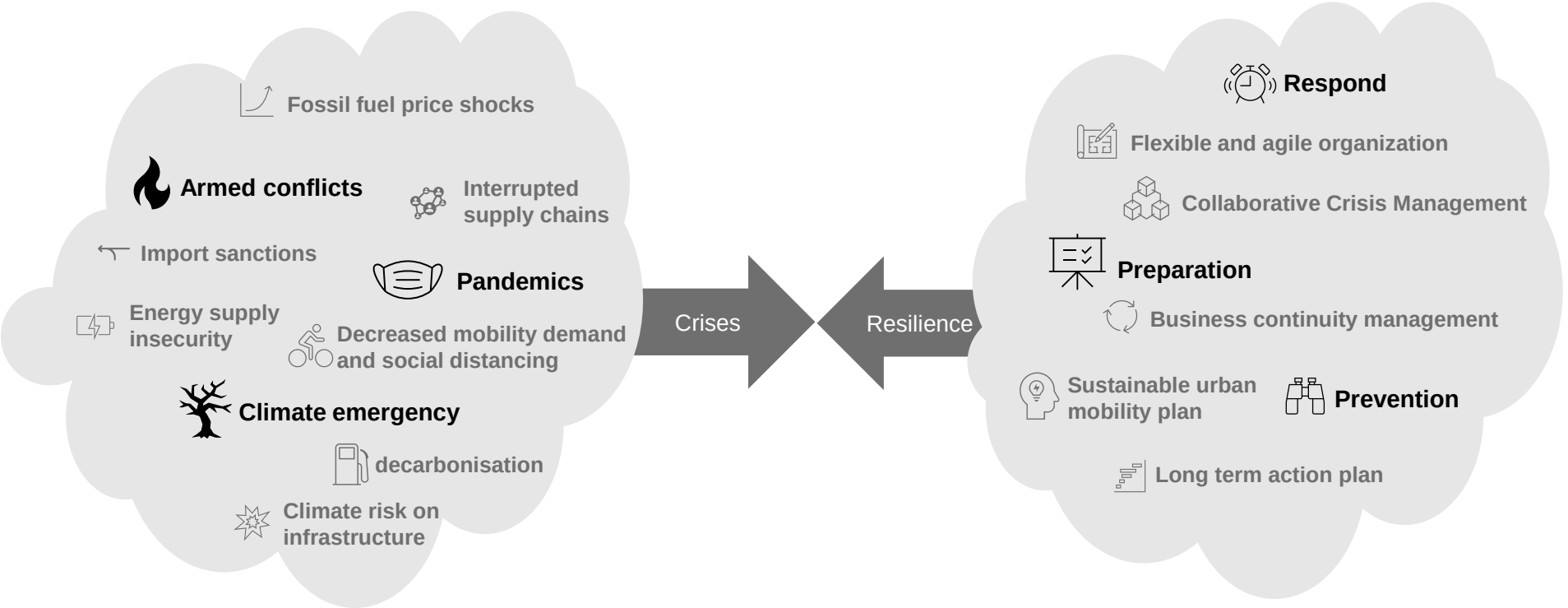
- To deal with the effects crises, a comprehensive approach for different stakeholders is needed
- The approach should build on an integrated crisis management framework, short term crisis response and long-term prevention
  - **Crisis management framework:** How to manage a crisis and prepare the necessary structures?
  - **Short term crisis response:** What can be done in the event of a fuel related crisis?
  - **Long term crisis prevention:** How can the impacts of a fuel crisis be mitigated, and the resilience of transport systems be strengthened?

Approach of the study

- Guidance to reduce fossil fuel dependency of urban transport systems and managing related crises
- To ensure resilience in the event of crises, actors need to understand the impact of specific local and global risks on urban transport systems better and prepare accordingly
- Governments, municipalities, businesses and transport operators worldwide are seeking guidance to reduce the dependency of their transport systems on fossil fuels, manage the related crises and embark on the transition towards sustainability
- TUMI has therefore conducted a study based on research and expert interviews with key stakeholders to outline measures and strategies for decision-makers, policy makers and transport operators on how to build resilient transport systems and to advance systematic crisis management

The pace and impact of global crises is accelerating. To handle consequences effectively, crisis management and prevention are key to build resilience.

What are we talking about?



To gain insight into the field crisis management in public transport systems, interviews with various stakeholders were conducted

Interview partners

National organisations

Deutscher Städtetag

difu Deutsches Institut für Urbanistik

NAFTOGAZ GROUP

DLR Deutsches Zentrum für Luft- und Raumfahrt

Municipalities

Lviv City Council

ACCRA METROPOLITAN ASSEMBLY

CITY OF THESSALONIKI

Public transport operators

SWM

WIENER LINIEN

HOCHBAHN

tumi giz

Crisis management for public transport systems is complex and requires collaboration and coordination among various stakeholders

Stakeholder

National governments

- National governments set the parameters for crisis management with regard to:
  - Establishing policy guidelines and protection of critical infrastructure
  - Setting organisational, technical, duty arrangements to call up crisis task forces
  - Coordinating at the national level and with the affected regions

Municipalities

- Municipalities are responsible for:
  - Assessing overall risks and implementing crisis prevention and response mechanisms
  - Coordinating local stakeholders (police, rescue services, fire protection, municipal services)
  - Increasing resilience of infrastructure
  - Communicating to the public

Public transport operator

- Ensuring continuity of service and support to critical infrastructure
  - Conducting regular risk assessments on public transport system
  - Establishing mechanisms for crisis prevention and management
  - Providing essential transport services

Logistic operator

- Provision of fundamental goods and services during crisis situation

To reduce the dependence of fossil fuels and manage the related crisis, actors urgently need to develop and implement actions

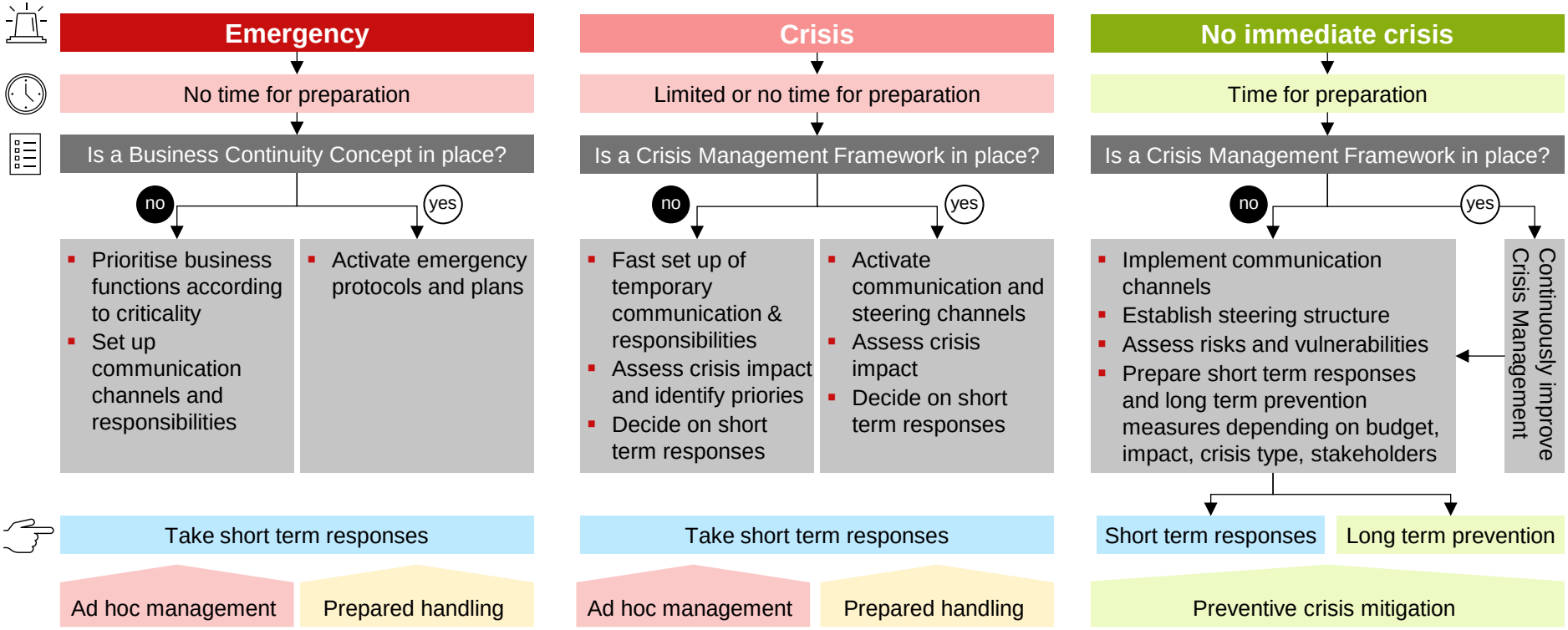
Crises such as	Consequences	Possible actions to deal with potential crises
CLIMATE emergency	Decarbonisation Green investments Climate risks on infrastructure	
PANDEMICS	Interrupted supply chains Decreased mobility demand and social distancing Rebound effect and price increase	
Armed CONFLICTS	Reduced fuel supply Import sanctions Volatility of energy prices	

- 6 Pop up bike lanes
- 7 Fuel prioritization schemes
- 8 Definition of priority / core urban transport network in case of crisis
- 9 Public transport fare reductions
- 10 Subsidies
- 11 Improving the availability of fossil fuels through greater storage capacity.
- 12 Electrification of bus fleet
- 13 Energy use optimisation strategies
- 14 Availability of multiple transport modes and infrastructure
- 15 Reallocation of road space towards public transport and active mobility
- 16 Public transport priority schemes
- 17 Sustainable Urban Mobility Plans
- 18 Parking management and Park & Ride concepts
- 19 Pricing schemes

Short term response | Long term prevention

The decisions to be taken depend on time, preparedness, budget and impact

What type of situation are we facing?



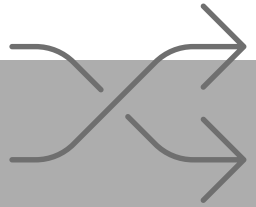
To establish a crisis management framework, involvement of stakeholders is crucial

	Budget required	Stakeholder involvement
Crisis management framework		
Business continuity management in public transport systems	$$	
- Emergency plans	$	
- Crisis training	$	
Crisis management in public transport systems	$$	
- Risk management & vulnerability analysis	$	
- Robust procurement	$	
Collaborative crisis management	$	
Knowledge exchange between stakeholders	$	
Resilience departments in municipalities	$	

The measures differ with respect to the required budget, stakeholder involvement and maturity of crisis management

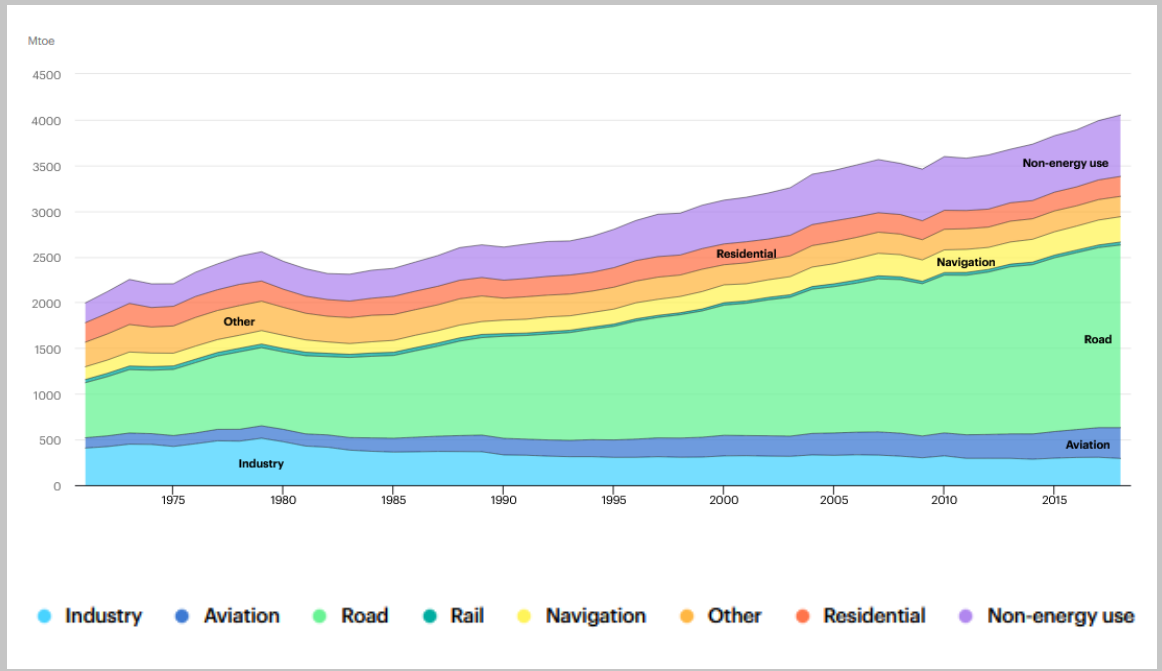
	Budget required	Stakeholder involvement	Required maturity of crisis management
Short term responses			
Pop up bike lanes	$		
Fuel prioritization schemes	$		
Definition of priority network	$		
Public transport fare reduction	$ $ $		
General fuel discount	$ $ $		
Long term prevention			
Parking management + P&R	$		
Pricing schemes	$		
Electrification of bus fleet	$ $ $		
Greater storage capacity for fossil fuels	$ $		
Public transport priority schemes	$		
Reallocation of road space	$		
Availability of multiple transport modes	$ $ $		
Sustainable Urban Mobility Plans	$ $		

2. Underlying trends



The transport sector is responsible for almost 60% of the global oil consumption and still heavily dependent on fossil fuels

Oil total final consumption by sector, 1971-2018



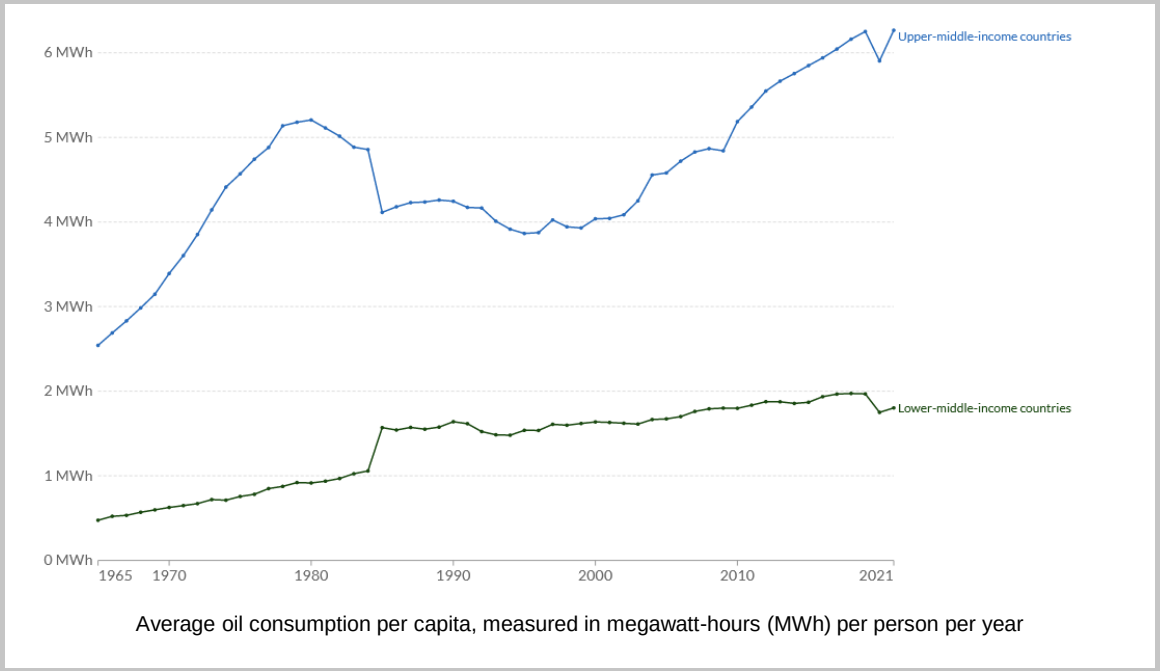
Oil consumption development

- In 2020, about 90% of the energy demand of the transport sector was covered with fossil fuels
- The road transport's consumption has increased steadily over the last decades
- Especially in lower-middle income countries the demand has risen

Further Information: IEA 2020

The oil consumption per capita in lower and middle income has steadily increased over the last twenty years

Oil consumption per capita



Average oil consumption per capita, measured in megawatt-hours (MWh) per person per year

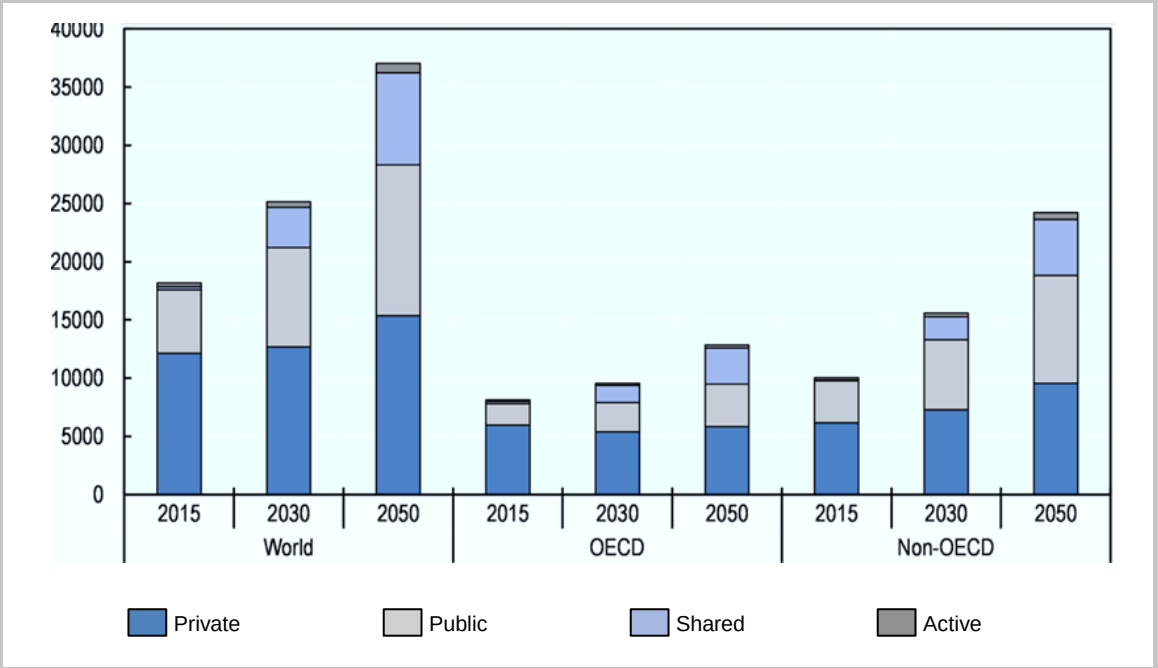
Oil consumption

- The total consumption of oil as the main energy source in the transport sector has increased in the last decades
- Especially in lower-middle income countries the demand has risen since the mid-80s due to rising incomes and population
- The pandemic led to a decline in oil consumption
- Both trend lines have grown steadily and show the increasing dependency on fossil fuels

Further Information: BP Statistical Review of World Energy

The population and income trends in Non-OECD are resulting in higher demand for mobility

Expected urban travel in billion passenger-kilometres



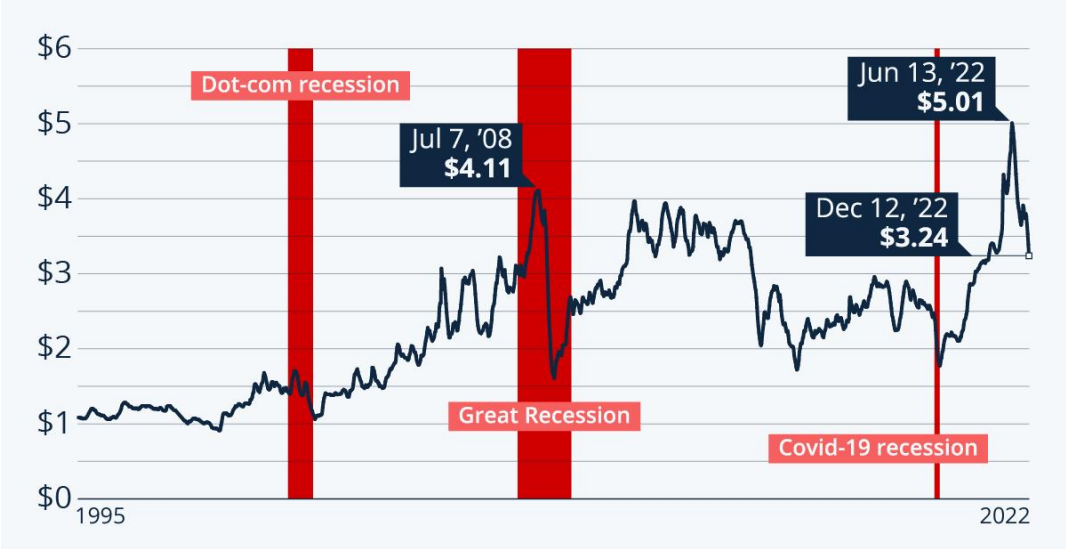
Urban travel development

- Growing population and income in emerging and developing countries increases mobility demand
- Non-OECD countries are expected increase their passenger-kilometres in urban travel 2.4 times by 2050, which will increase the related energy demand
- This development might further aggravate the exposure of these countries to fuel prices shocks if the dependency on fossil fuels is not reduced.

Further Information: OECD, ITF Transport Outlook 2019

The accelerated pace of multiple crises is leading to higher fuel price volatility and confronting transport systems with unprecedented impacts

Weekly average retail price of regular gasoline in the U.S per gallon, incl. taxes



*weighted average based on price collected each Monday from of approximately 1000 gas stations

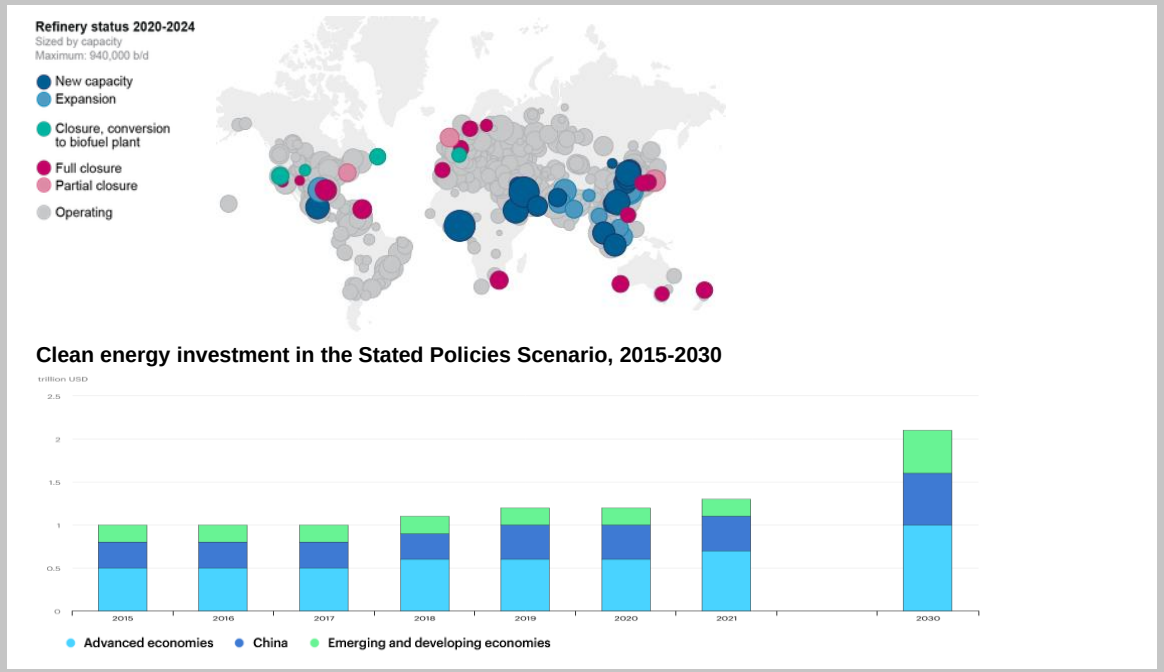
Fuel price development

- A retrospective analysis of the price development of regular gasoline illustrates that economic crises have led to strong price fluctuations on several occasions in recent years
- As a result of the corona pandemic, demand for fossil fuels decreased considerably, causing prices to fall in 2020 and rebound in 2021.
- In particular, the Russian attack on Ukraine led to a significant price volatility, as Russia is one of the largest exporters of fossil fuels.

Further Information: SPG Statista gasoline price 2022

In some regions investments in oil refineries are declining, while clean energy investments are expected to grow substantially in the next decade

Investment in oil refineries (greenfield and upgrades) by region

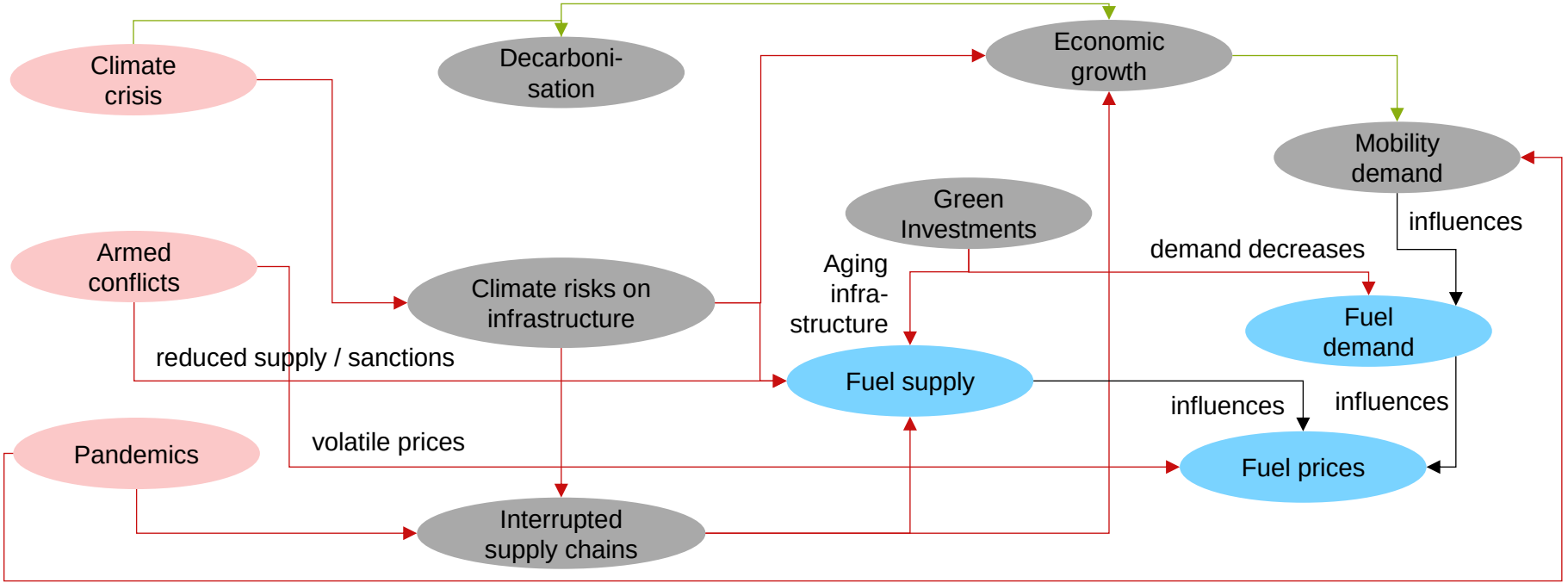


Changes in Investments

- Renewable energy and electric vehicles are reducing demand for fossil fuel
- The decreasing need for fossil fuels has caused some refineries to shut down or rebuild
- Companies are diversifying their investments by turning to renewable energy and new technologies to improve refinery efficiency, reduce costs, and adapt to climate risks.

Further Information: SPG Global 2022 Link , IEA 2020 Link

Multiple crises and their consequences have led to increasing volatility in regional and global fuel markets

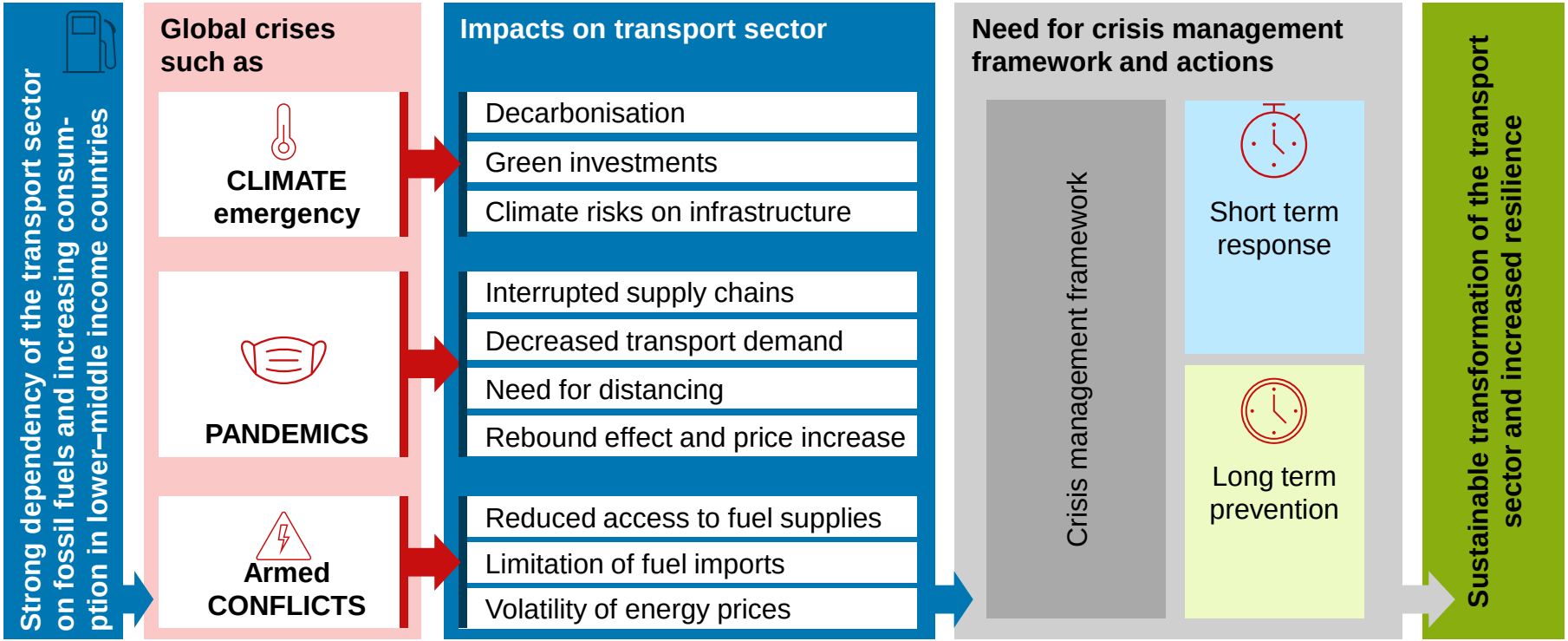


Legend

- Positive effect / increase
- Negative effect/ decrease
- Positive or negative effect

Crisis | Fuel market | Conse-quences

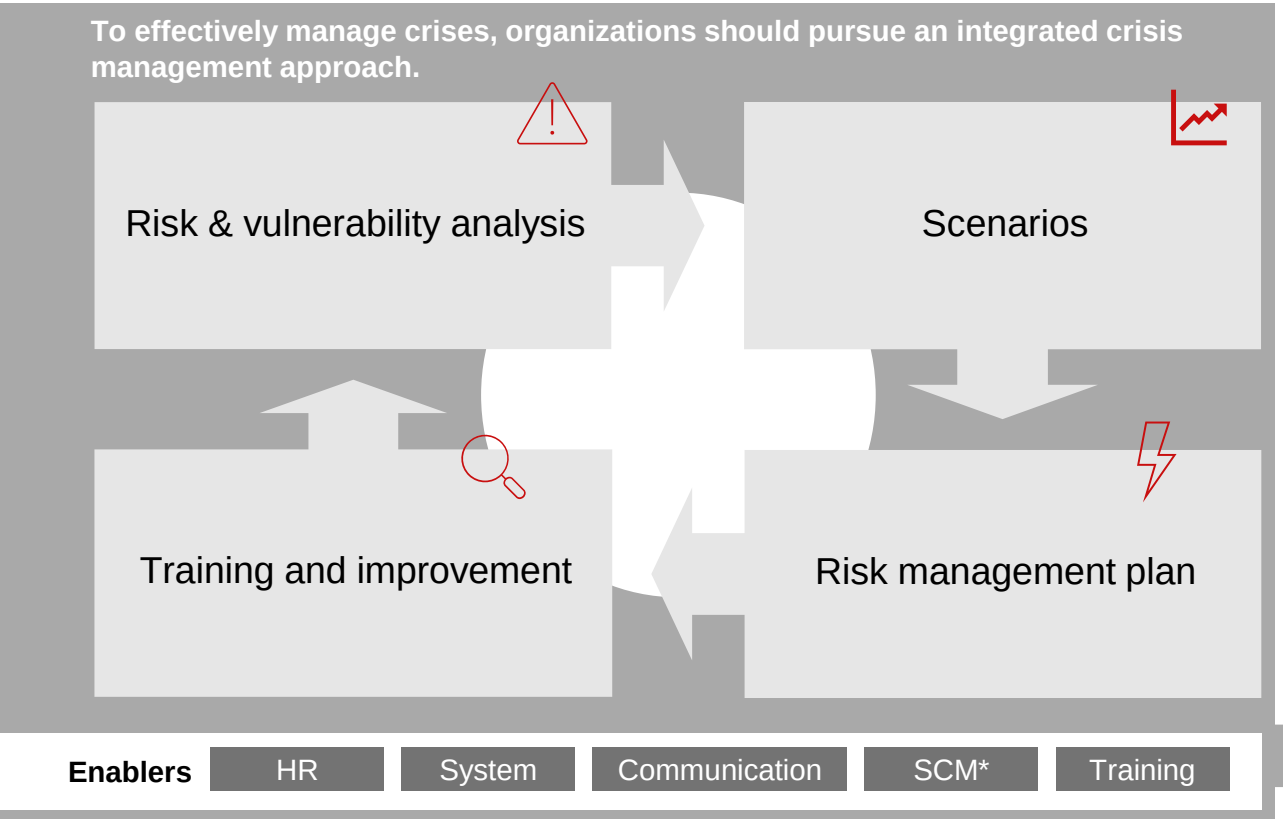
To be able to confront global crises and increase the resilience of transport systems, decision makers need to establish a crisis management



3. Introduction of crises handling approaches

Crisis Management Framework

To effectively manage crises, organizations should pursue an integrated crisis management approach.



Actions

The concrete courses of action to respond or prevent crises can be differentiated according to the time dimension.

Short term response

- Ad hoc measures for crisis response
- For example pop-up bike lanes or subsidised public transport tickets

Long term prevention

- Measures with a long-term planning horizon to prevent crises
- For example availability of multiple transport modes

* SCM: Supply Chain Management

Crisis management can have different levels of maturity. Preventive crisis mitigation allows for a better response and resilience.

1.

Ad hoc crisis management

- The organization does not have any mechanisms that can be consulted in the event of a crisis
- Vulnerabilities as well as compensatory actions are not identified
- Crisis management is carried out in a reactive manner and is heavily dependent on individual persons
- Limited attention is attributed to the installation of a crisis management system

2.

Prepared crisis handling

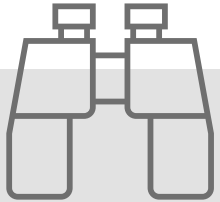
- The organization has a business continuity management and crisis management approach
- Vulnerabilities are analysed and mitigation strategies are designed
- Furthermore, crisis plans and a crisis management system exist
- Through continuous plan–do–check–act cycles, the level of preparation is continuously improved and adjusted

3.

Preventive crisis mitigation

- In addition to preparatory measures and structures for crisis management, measures are taken in order to prevent crises from arising
- Prevention is cheaper in the long term due to more resilient transport systems and allows for more flexibility to act in the event of a crisis

4. Crisis management framework



The following measures were discussed with the interview partners*:

Interview partners	Crisis management framework		
NAFTOGAZ GROUP	2.1 Risk management & vulnerability analysis	2.2 Robust procurement	3 Collaborative crisis management
Deutscher Städtetag / DLR			
difu Deutsches Institut für Urbanistik	4 Knowledge exchange between stakeholders		
CITY OF THESSALONIKI	4 Knowledge exchange between stakeholders	5 Resilience departments in municipalities	
ACCRA METROPOLITAN ASSEMBLY	5 Resilience departments in municipalities		
Lviv City Council	3 Collaborative crisis management	4 Knowledge exchange between stakeholders	
SWM	1 Business continuity management in public transport systems	2 Crisis management in public transport systems	1.2 Crisis training
	3 Collaborative crisis management		
WIENER LINIEN	1 Business continuity management in public transport systems	2 Crisis management in public transport systems	1.1 Emergency plans
	3 Collaborative crisis management		
HOCHBAHN	1 Business continuity management in public transport systems	2 Crisis management in public transport systems	2.1 Risk management & vulnerability analysis
	1.1 Emergency plans	2.2 Robust procurement	3 Collaborative crisis management

* The interview partners did not necessarily implement the respective measures themselves and in some cases, the effectiveness of the measures was also critically questioned.

Business continuity management in public transport systems

Crisis management framework

1

Goal	Ensuring elementary business functions in an emergency situation
Stakeholder	Public transport operator
Precondition	Overview of critical infrastructure for operation of the transport system

Further Information: Standard 200-4 BCM, BSI (2022), Link

Measure description

- Business Continuity Management enables organizations to protect and sustain critical processes during a disruption due to an emergency. Therefore, it is essential to evaluate the potential risks and failures that may arise. By doing so, emergency plans can be created, and strategic actions implemented to ensure business continuity in case of a crisis. It is also important to follow quality standards such as DIN EN ISO 22301, which outlines the requirements for a Business Continuity Management System (BCMS).

Measure elements and process steps

- Business Impact Analysis (Identification of critical processes)
- BCM-Risk analysis (Evaluation of risks and vulnerabilities)
- Business Continuity Concept (Strategies and measures for standardized emergency procedure)
- Improvement of BCM (Awareness trough training and practice)

Example

- Stadtwerke Munich implemented a Business Continuity Management system that includes policies, procedures, and processes to ensure organizational preparedness for different emergency scenarios. They also established communication protocols to improve communication with relevant authorities and the municipal services.

Business Continuity Management addresses emergencies and aims to sustain critical processes

Emergency

An emergency is a damaging event in which an organisation's processes or resources do not operate as intended. The availability of the corresponding processes or resources cannot be restored within the required time.

Example in transport operations: Blackout

Business Continuity Management

Emergencies which escalate can turn into a crisis

Crisis

A crisis can be defined as a situation of instability or danger with potential adverse impacts on society, economy and environment. A crisis is typically unique and therefore frameworks rather than strict flow charts are required to deal with the consequences.

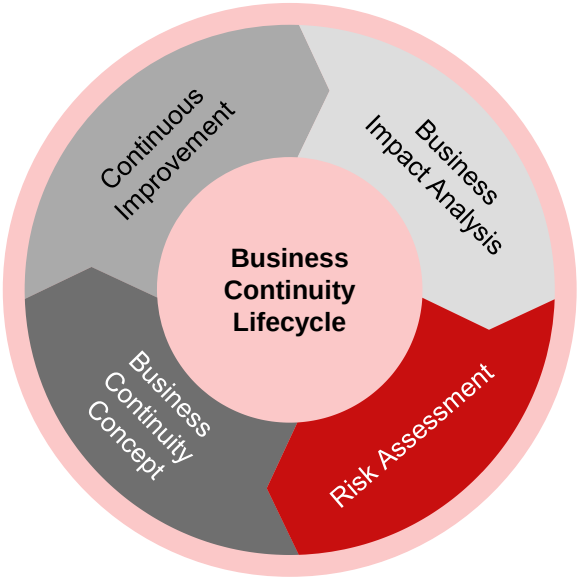
Example in transport operations: COVID-19 pandemic

Crisis Management

Further Information: BSI (2022), Link

Business continuity management in public transport systems

Crisis management framework



Communications, Training and Reporting

Business Impact Analysis

- Identification of critical processes of the business
- Gathering of data to understand the system and dependencies
- Prioritisation and definition of criticality of business functions
- Definition of recovery targets

Risk Assessment

- Identification of risks
- Assessment of risks based on likelihood and impact
- Evaluation of vulnerabilities of the transport system
- Grouping of risks and scenarios

Business Continuity Concept

- Development of strategies and emergency plans per function necessary to sustain operations, including a cost-benefit analysis
- Implementation of concept with sequence, tasks and responsibilities
- Set up of process organisation and communication channels

Continuous Improvement

- Continuous improvement trough trainings and exercises
- Integration of concept into organisational structures to ensure functionality

Further Information: Carnegie Mellon University (2023), Link

Emergency plans

Crisis management framework

1.1

Goal	Ensuring elementary business functions even in emergency situations
Stakeholder	Public transport operator
Precondition	Analysis of critical business processes

Measure description

- Emergency plans are comprehensive instructions on how to proceed in the event of an unforeseen interruption of operations. The central building blocks are how to communicate, how to operate emergency transport services and how to re-establish operations after the emergency.

Measure elements and process steps

- Development of specific emergency plans for scenarios with highest risk and impact on transport operations including
  - Responsibilities
  - Integration into usual business processes
  - Description of process steps to re-establish operations and internal and external communication

Example

- Vienna’s transport operator has developed emergency plans for the three phases of blackouts, the first phase were everything is brought to standstill and passengers need to be evacuated and the system closed, the second phase where only diesel busses are operational with an emergency reserve, covering hospitals, and a third phase in which the system is rebooted.

Training

Crisis management framework

1.2

Goal	Prepare organizations to respond effectively to emergencies
Stakeholder	Public transport operator & municipalities
Precondition	Availability of emergency plans and crisis protocols

Measure description

- Development of a emergency training program by the transport operator in coordination with the authorities based on the business continuity strategy.

Measure elements and process steps

- Based on the business continuity strategy a training program is developed
- Conducting the training program as well as embedding crisis management in operational routine
- Continuously reviewing and updating the crisis training program to ensure that it remains current and relevant

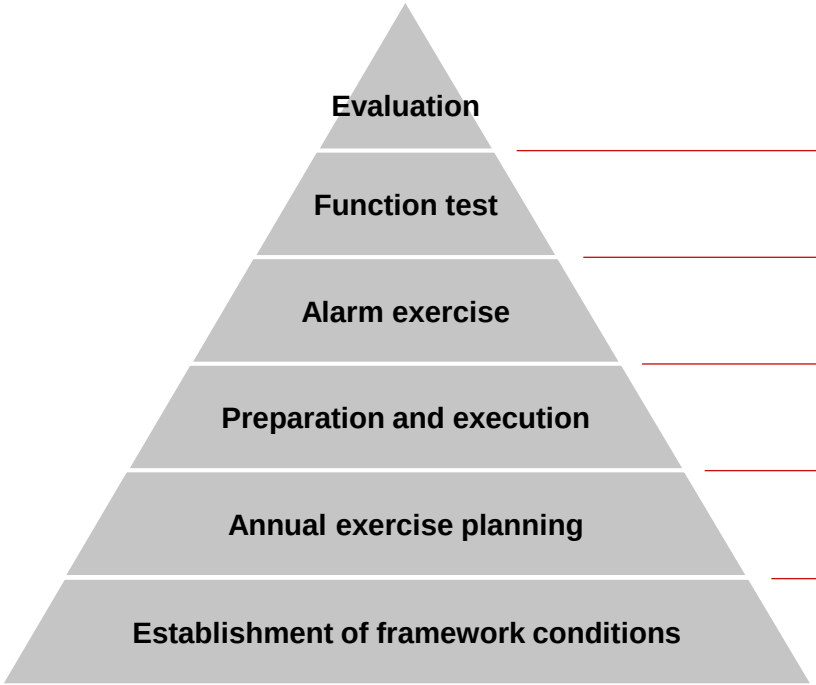
Example

- The Hamburger Hochbahn and other public transport operators like the Wiener Linien work closely with the municipality and other relevant authorities such as police, fire workers, rescue services, and municipal services to develop joint emergency management plans and protocols. These cooperations are essential for ensuring that parties are prepared and coordinated in the event of an emergency.

Emergency trainings are an important element to ensure effective crisis responses

Training

1.2



- Feedback loops after the training
- Evaluation of the training objectives derivate learning effects

- Function test of the existing emergency plans
- Review of the emergency mechanisms and the respective scheduling

- Determination of the response times of the prevention process
- Checking whether the technical and organizational measures work

- The concept is tailored to a specific scenario
- Testing the functionality of resources for the emergency situation

- Coordination of the period for emergency exercises

- Exercise type selection according to the respective goals and content
- Exercise scope and conceptual design on record

Further Information: BSI (2022) Link; BBK Link

Crisis management in public transport systems

Crisis management framework

Goal	Minimize potential impacts of crises on public transport systems
Stakeholder	Public transport operator
Precondition	Awareness of systemic vulnerabilities and possible crisis scenarios

Measure description

- Crisis management is a process designed to prevent or mitigate the damage a crisis can inflict on a transport system. Due to the uniqueness of crisis, organisational structures for coordination, communication systems and a scalable crisis management should be set up to allow for flexible responses. Risks and vulnerabilities should be analysed and procurement systems should be checked for robustness.

Measure elements and process steps

- Implementation of a crisis-resistant communication system with established communication protocols that ensure effective communication between all stakeholders
- Establish an organisational structure with clear responsibilities
- Installation of a crisis management system with escalation levels depending on the type and impact of the crisis.

Example

- The crisis management of Hamburger Hochbahn is characterized by a clear handling approach based on the crisis impact. In the event of short-term impact, emergency teams are established which are individually tailored to the crisis situation. In the case of long-term crises such as the corona pandemic, on the other hand, task forces are formed that involve all specialist departments of Hamburger Hochbahn. The entire crisis management process is also supported by crisis management software, which is used as a quantitative decision-making basis.

A functional crisis management in public transport systems consists of three components

Crisis resistant communication

- Promptness (active and early)
  - Implementation of a communication network and standardized information processing
  - establish clear line of communication between relevant stakeholders
- Truthfulness (factual, transparent)
  - Warning rules (external internal) clearly regulated by dedicated organizations
- Comprehensibility (short, simple, straightforward, pictorial)
- Consistency (uniform, coordinated and continuous)

Organisational structure with clear responsibilities

- Crisis team is divided into individual staff sections with associated tasks
- Crisis Team Leader
  - Decision function
- Crisis Management Team
  - Specific competencies for the implementation of measures
- Selective engagement of consultants, if special knowledge is necessary
- Regulation of all aspects related to human resources

Crisis management with different escalation levels

- Crisis organization (crisis team, task force, situation centre)
- latent crisis phase report early warning systems
  - existing concepts must be adapted with expected crisis scenario
- acute crises, alerts are sent to all authorities
  - entire crisis team is ensured operationally and strategically
- Impact: local vs global
- Internal crisis vs. crisis for the entire municipality or region

Further Information: BMI (2014/2016) Link

Risk management and vulnerability analysis

Crisis management framework

2.1

Goal	Mitigation of potential risks and vulnerabilities
Stakeholder	Public transport operator
Precondition	Information management system to identify risks

Further Information: BBK Link

Measure description

- Risk Management requires identifying potential risks, assessing them and creating strategies to prevent or minimise these risks. Vulnerability analysis on the other hand involves identifying weaknesses of the transport system based on specific crisis scenarios.

Measure elements and process steps

- Identification and assessment of potential risks according to likelihood and impact
- Assessment of potential vulnerabilities of the transport system based on crisis scenarios
- Development of a risk management plan with staff structures, responsibilities and communication plans to address the identified vulnerabilities.

Example

- Hamburger Hochbahn conducts vulnerability as well as risk analyses to ensure the safety of its urban transport system. Building on the results, Hamburger Hochbahn is particularly focusing on blackout and flood scenarios. In addition, Hochbahn has improved its risk management practices by conducting reliable RCM assessments to keep track of price increases and minimize economic shocks.

Robust procurement systems

Crisis management framework

2.2

Goal	Robust procurement systems to minimise crisis impacts
Stakeholder	Public transport operator
Precondition	Clearly defined procurement policies and procedures, incorporated risk analyses

Measure description

- Robust procurement system allow to minimise the risks for resources shortages through the diversification of suppliers and long-term supplier management.

Measure elements and process steps

- Establishment of a diversified supplier network for maintaining a reliable supply for construction materials and replacement components.
- Establishment of long-term framework contracts for fossil fuel supply, considering geographical risks.

Example

- With the help of the risk & vulnerability analyses, Hamburger Hochbahn identified potential material shortages that could occur during the construction of the new depots, which are primarily designed for the electric bus fleet. To meet the targeted schedule for the construction of the depots, Hamburger Hochbahn is procuring materials from various suppliers.
- Wiener Linien has decided not to diversify its fuel suppliers, but rather establish a permanent framework contract with a national supplier, which will prioritise national demand in case of a crisis

Collaborative crisis management

Crisis management framework

3

Goal	Cooperation between municipalities and transport operators in respect to crisis management
Stakeholder	Public transport operators & municipalities & critical infrastructure providers
Precondition	Establishment of a clear governance structure and openness regarding data exchange

Measure description

- Collaborative crisis management can be defined as the collective efforts of multiple actors such as municipalities, police, fire workers, rescue services and municipal services in working across organizational boundaries, to prepare for, respond to, and learn from a crisis. A joint crisis management approach between involves a continuous exchange, with clearly defined communication channels.

Measure elements and process steps

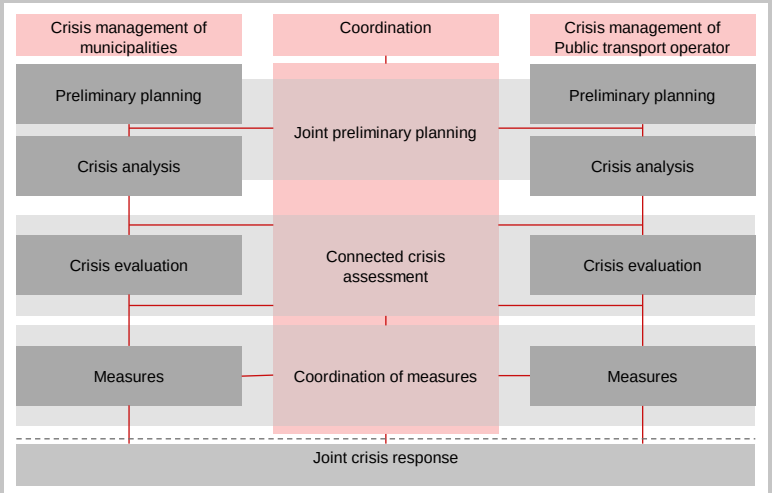
- Collaborative crisis management is usually initiated by the municipality and should include relevant local actors. Initially common goals and a collaboration arrangement should be established to allow for a coordinated crisis handling.
- The crisis management should build on a inter-organisational committee, with defined communication channels to react quickly and find a collective response, to ensure the continuity of transport services during crises.

Example

- In the city of Vienna, the public transport operator and regional municipalities have a joint crisis management with different level of organizational crisis management to ensure coordinated crisis management in the city.
- Hamburg‘s transport operator is integrated into the city‘s crisis management system and connected to all relevant public authorities. Communication scenarios are clearly outlined.

Crises can be addressed holistically with the help of a collaborative crisis management between municipalities and public transport operators

Collaborative crisis management
Harmonization process in integrated crisis management



Link between business continuity and crisis management is exchanged through crisis and emergency management

Level of crisis management in an organization

1 Personal
- Alarm monitoring
- Alerting and requesting of authorities and organizations

2 Situation
- Analysing the situation
- Informing other organizations

3 Assignment
- Determining the required task forces, resources and reserves
- Evaluate the situation

4 Logistics
- Determining the supply
- Requesting further resources

5 Press and media relations
- Initiate warning notices
- Collecting, selecting and processing information from the assignment

6 Communications
- Monitoring the communication operation
- Ensuring the communication organization

Knowledge exchange between municipalities

Crisis management framework

4

Goal	Development of a state-of the-art crisis management through external knowledge sharing
Stakeholder	Municipalities
Precondition	Open exchange and profound relations with other cities

Measure description

- To enhance the crisis management capabilities cities should engage in regular exchanges, conferences and working groups. These formats provide the opportunity for cities to share experiences, strategies and recommendations on crisis handling and learn form their peers.

Measure elements and process steps

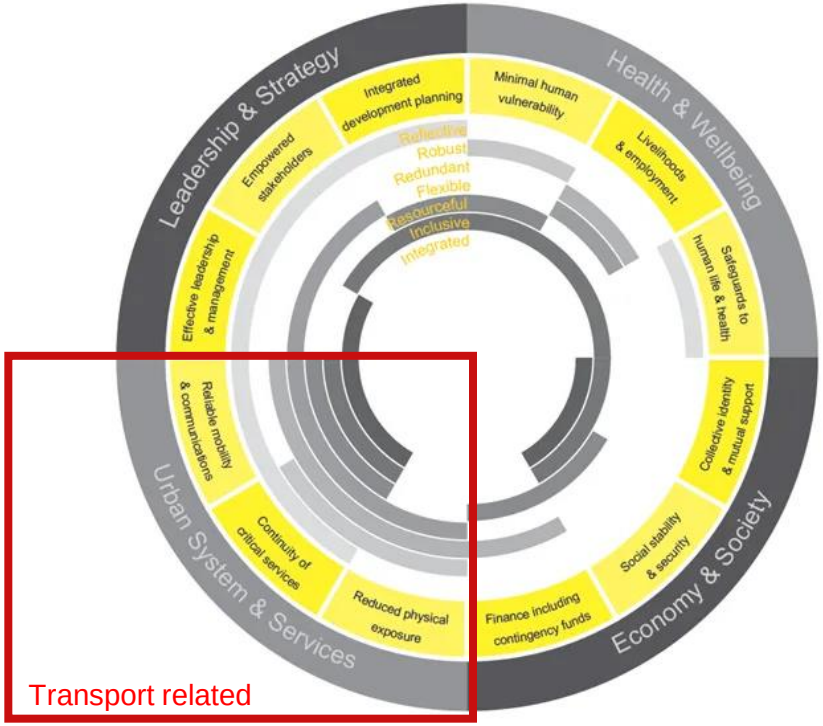
- Identify role model cities with similar conditions for valuable exchange.
- Installation of exchange formats on the subject of crisis management
- Introduction of information sharing to ensure successional development of crisis management

Example

- In 2013 the Rockefeller Foundation selected cities to join the 100 Resilient Cities Network to develop resilience strategies and exchange with other cities in communities of practice. The network also enables cities to tap into new sources of funding and gain international attention.
- During the Corona Pandemic German municipalities exchanged on pop up bike lanes in webinars and shared regulatory and planning aspects to be considered in the implementation.

The City Resilience Framework offers a holistic approach to urban resilience

Knowledge exchange between cities



Further Information: 100 Resilient Cities Network (2013)

The framework is based on 12 goals contributing across four critical dimensions of city resilience:

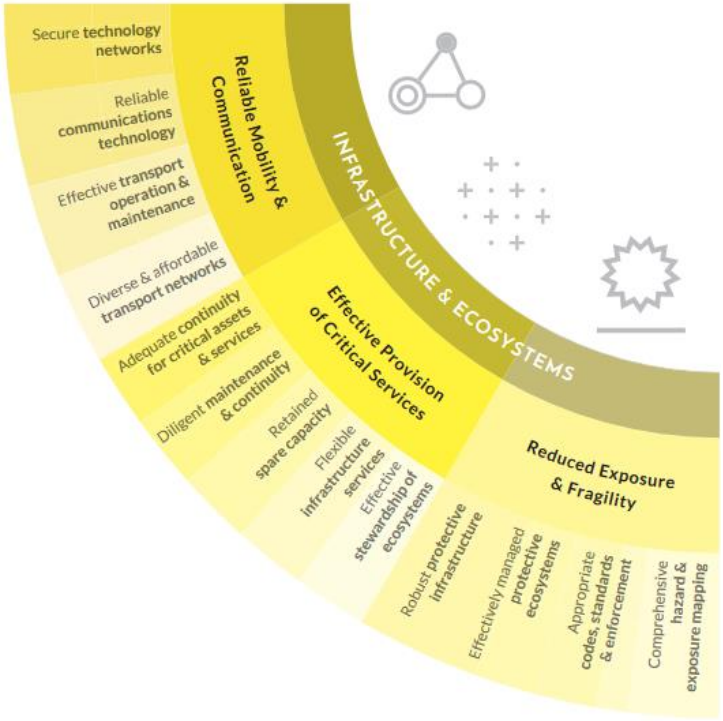
1. Health and wellbeing of individuals (people)
2. Urban systems and society (organization)
3. Economy and society (organization)
4. Leadership and strategy (knowledge)

Resilient systems should be:

- Reflective
- Robust
- Redundant
- Flexible
- Resourceful
- Inclusive
- Integrated

Transport related resilience consists of three areas

Knowledge exchange between cities



Public transport systems

Reliable communications and mobility is enabled by diverse and affordable multi-modal transport systems and information and communication technology (ICT) networks, and contingency planning.

- Diverse and affordable transport networks
  - Diverse and integrated transport networks, providing flexible and affordable travel around the city for all.
- Effective transport operation and maintenance
  - Effective management of the city's transport network to provide quality, safe transport.
- Reliable communications technology
  - Effective and reliable communication systems that are accessible by all.
- Secure technology networks
  - Robust, effective mechanisms in place to protect the information and operational technology systems on which the city is dependent.

Further Information: 100 Resilient Cities Network (2013)

Resilience departments in municipalities

Crisis management framework

Goal	Develop a comprehensive resilience strategy and build competence in municipalities
Stakeholder	Municipalities
Precondition	Political will create department within municipality

Further Information: City of Thessaloniki, Link

Measure description

- To improve crisis preparedness, the establishment of a special resilience department in the municipality is supportive. This department should serve as an intermediary between the departments and other external stakeholders to take a coordinated approach on planning and implementing resilience measures for urban areas.

Measure elements and process steps

- Definition of the scope of the resilience department (objectives and focus)
- Development of a sustainable resilience strategy including concrete measures and their realization schedule
- Building a resilience network by involving organizations from the public sector, technological institutes, and local authorities.

Example

- Thessaloniki has recognized the importance of building resilience in the face of multiple crises, including corona and financial crisis. As a result, the city has implemented a resilience department to coordinate and manage initiatives aimed at building resilience, including public transport systems. The resilience department works closely with other departments, stakeholders, and community members to enhance the city's resilience.

The Essentials for making public transport systems resilient

Resilience Departments

Resilience department in municipalities

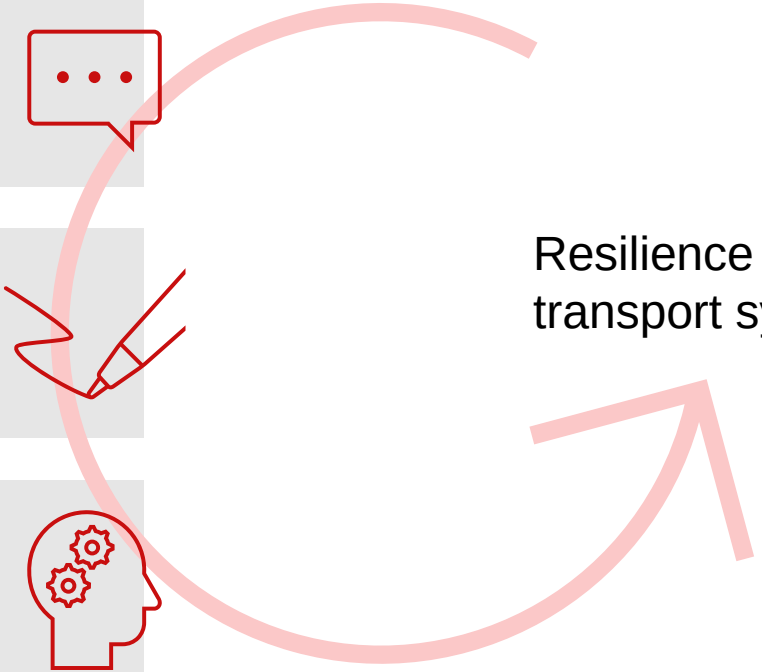
- With the help of a resilience department, efficient coordination with delineated responsibilities can be ensured. All parties involved are steered by the department and integrated into crisis management in accordance with their responsibilities.

Knowledge about potential crises

- The resilience department provides risk assessments used for the long-term development of the urban transportation system, including current and future investment decisions that contribute to improved resilience.

Effective crisis response

- To ensure an effective response to crises, the resilience department creates preparedness plans and updates them regularly. Additionally, the department is connected to an early warning systems and enhances emergency management capacities through public preparedness trainings.



5. Short term response

The following measures were discussed with the interview partners*:

Interview partners	Short term response		Long term prevention		
DLR Deutsches Zentrum für Luft- und Raumfahrt	6 Pop up bike lanes				
Deutscher Städtetag	9 Public transport fare reduction	10 General fuel discount	18 Parking management and Park & Ride concepts	19 Pricing schemes	
difu Deutsches Institut für Urbanistik			18 Parking management and Park & Ride concepts		
CITY OF THESSALONIKI	6 Pop up bike lanes		12 Electrification of bus fleet	15 Reallocation of road space towards public transport and active mobility	17 Sustainable Urban Mobility Plans
ACCRA METROPOLITAN ASSEMBLY			18 Parking management and Park & Ride concepts		
Lviv City Council	7 Fuel prioritization schemes	8 Definition of priority / core urban transport network in case of crisis	11 Improving the availability of fossil fuels through greater storage capacity	14 Availability of multiple transport modes and infrastructure	
SWM	8 Definition of priority / core urban transport network in case of crisis				
WIENER LINIEN	8 Definition of priority / core urban transport network in case of crisis		16 Public transport priority schemes		
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* The interview partners did not necessarily implement the respective measures themselves and in some cases, the effectiveness of the measures was also critically questioned.

Pop-up bike lanes

Short term response

6

Goal	Satisfaction of an increasing cycling demand, reduction of motorised transport
Stakeholder	Municipalities, society
Precondition	Willingness of the population to switch to cycling as a mode of transport

Measure description

- Temporary bike lanes are a popular approach to promoting cycling in urban areas. They provide an alternative to fossil fuel-dependent transportation modes without requiring extensive and costly building activities and can be implemented quickly. Pop-up bike lanes are designed to improve traffic safety on streets with inadequate bicycle infrastructure, reducing the risk of accidents and encouraging more people to cycle.

Measure elements and process steps

- Identification of suitable cycling routes with high demand and inadequate infrastructure in urban areas
- Ensuring fast and safe integration into the traffic network through temporary boundaries and coloured road markings
- Testing the acceptance of the citizens towards the new bicycle infrastructure

Example

- In the context of the corona pandemic, the city of Berlin decided to create several pop-up bike lanes. The bike lanes were designed to respond to the increasing demand for individual active mobility due to the risk of contagion. Existing plans for future bicycle infrastructure served as the framework for the pop-up bicycle lanes. In addition, several bicycle lanes were converted to fixed bicycle lanes after the pandemic.

The city of Thessaloniki installed pop up bike lanes to respond to the mobility crisis without high costs and at short notice

Starting point Thessaloniki

Thessaloniki faces multiple crises that have an impact on the urban transport system. Among the most severe crises are the financial and mobility crises.

- Financial Crisis
  - Greece has only slowly recovered from the financial crisis since 2008 and has a very strict budget for urban transport infrastructure
- Mobility crisis
  - The road network of the city is struggling with the increasing demand of individual motorised transport, and the high volume of cars on the roads has led to significant traffic problems.
  - Furthermore, the city is confronted with a high level of air pollution due to motorised transport

CITY OF THESSALONIKI

Pop up bike lanes

One approach to compensating for the identified problems are short-term pop up bike lanes.

- Based on data analysis, traffic bottlenecks were identified. Derived from the results two pop up bike lanes were established
  - The goal was to promote cycling through improved infrastructure
- In addition, Thessaloniki started multiple campaigns to promote cycling through awareness raising
  - The focus was in particular on young people
  - Implementation of cycling maps and apps to improve usage of bicycle lanes
- Short-term implementation was possible due to the low intensity of costs for bicycle lanes and low bureaucratic hurdles

Further Information: adfc Berlin 2020 Link, City of Theassaloniki Link

Fuel prioritisation schemes

Short term response

Goal	Ensuring core operations of the urban transport system in crisis situations
Stakeholder	National/ regional government and municipalities
Precondition	Close cooperation between different levels of governments and critical infrastructure providers

Measure description

- In a crisis supply shortage and distribution problems can lead to a scarcity of fossil fuels. In order to maintain the operation of urban transport systems in such situations, priority schemes for critical infrastructures including public transport and transport operator are implemented.

Measure elements and process steps

- Identification of critical infrastructures in the geographical area regarding resource supply or passenger transport
- Development of a concept for prioritization of critical infrastructure prior to potential crises
- Implementation of prioritisation schemes in crisis

Example

- The city of Lviv decided in May 2022 as a result of the gasoline shortage in Ukraine to give buses priority access to fossil fuel reserves in order to maintain the central routes of the bus network. In addition, some agreements have been concluded between petrol stations/chains and logistics service providers - to the extent that some petrol stations only supply business clients and no longer serve private vehicles.

The following factors and facilitates should be known for the prioritising the distribution of fuels:

In order to be able to carry out the prioritisation of fuel, the following factors should be known:

- Which critical infrastructures exist in the reference area?
- What would be the impact of the failure of the basic service?
- Can the service be substituted?
- What is the time urgency of this failure?
- How are the critical infrastructures equipped with emergency generators and fuel?
- What self-provisioning can the state emergency response rely on?
- What are the fuel requirements of the critical infrastructures?

Facilities and installations to be taken into account when prioritising the distribution of fuel:

- fire brigade, rescue service, police, relief organisations, disaster control authorities
- Digital radio operators
- Hospitals and medical infrastructure
- Electricity, gas, water, waste water companies
- Telecommunications network operators
- Basic service and infrastructure providers (livestock farms, ports)
- Facilities for supplying the population (food, etc.)
- Emergency shelters
- Public transport
- Public media
- Prisons

Further Information: BBK (2021), Link

General prioritisation process for critical infrastructure on the example of transport systems

Short term response

1 Scenario independent prioritisation

Society protection

- Review of the impact of crises on human capital
- Analyse the consequences of urban transportation system failure.

Scope

- Effects of price shocks on public transport
- Coverage loss in case of fossil fuel shortage
- Strong networking of infrastructures can trigger a domino effect

Time

- Temporal anticipation of fossil fuel induced crises for the urban transportation system.
- Timing until the consequences of a crisis are felt by the population (failure of routes and trains)

2 Scenario dependent prioritisation

Stress criteria

Function

- Is the function of public transport restricted?

Stress

- To which extent is the public transport limited? (slightly/medium/severely)

Time

- Does the impact intensify over time?

Measure criteria

Human Resource

- Allocation of responsibilities (e.g. public transport control center)

Resource

- Possible alternatives to maintain public transport

Supply Chain Management

- Which organizational units must always remain active?

3 Adjusted prioritization

Verification

- Verification and adjustment of scenario dependent prioritisation dependent on crisis situation
- Allocation and distribution of critical resources to the operators of essential infrastructures

Further Information: BBK (2021), Link

Definition of priority / core urban transport network in case of crisis

Short term response

8

Goal	Operation of core urban transport network with relevance for critical infrastructure
Stakeholder	Public transport operator and municipalities
Precondition	Understanding of the key transport needs and patterns

Further Information: BBK 2021 Link

Measure description

- Definition of priority / core urban transport network in case of crisis involves identifying the most critical transportation corridors and routes that are necessary to maintain access to essential services and resources. This may involve prioritizing routes that serve emergency housings and other critical facilities.

Measure elements and process steps

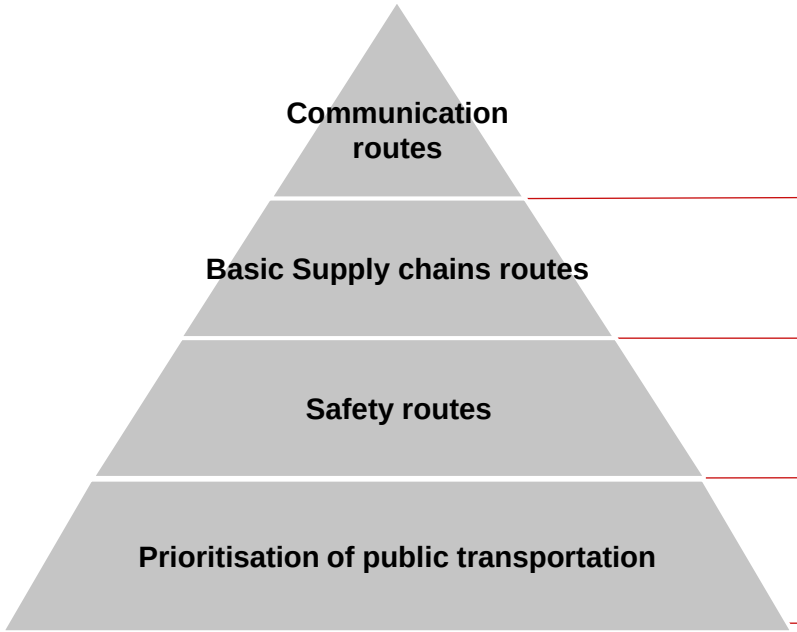
- Conduct a transportation needs assessment by analysing data (traffic volume, transportation modes, critical infrastructure etc.)
- Identify key routes for the urban transportation system.
- Coordination and agreement on system-relevant routes with other public transport operator and municipalities

Example

- As a result of the gasoline shortage in Ukraine induced by the Russian invasion and an increasing shortage of drivers and vehicles, public transport services in Lviv were reduced to about 25% of their original volume. Only core routes and central evacuation routes for refugees were maintained.

Selection of essential routes in case of crisis

Short term response



- Maintaining routes to facilities with communication function
- Maintaining emergency communications for safety facilities

- For the maintenance of basic needs and safety facilities, logistic routes in urban transport must be preferred
- Enabling routes for workers to the logistics hubs

- In order for the state system to ensure safety in a crisis, traffic routes must be prioritized to shelters

- Public transport is given priority over individual transport
- Public and logistic transportation always have priority in case of shortage of a essential assets

Further Information: BBK (2021), Link

Public transport fare reduction

Short term response

9

Goal	Financial relief for the population in terms of mobility
Stakeholder	National/regional government, municipalities
Precondition	Financial resources to subsidize public transport tickets

Measure description

- Subsidized public transport tickets are usually implemented by the government or other public institutions, with the aim of ensuring essential services, promoting the use of low carbon transport and reducing CO_2 emissions. The measure can take different forms, such as direct subsidies to public transport providers, general fare reductions or discounted tickets for specific groups (e.g. students, elderly, low-income individuals).

Measure elements and process steps

- Assessment of the funding sources for the subsidy
- Determine the ticket price and the percentage of subsidy
- Coordination with public transport authorities and transport operators

Example

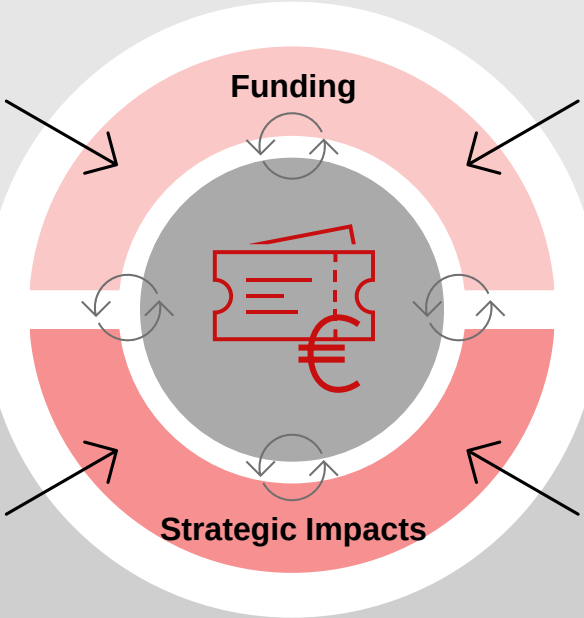
- To alleviate the rising energy expenses caused by Russia's aggression against Ukraine and to promote a reduction in car usage in favour of public transportation, the German government implemented a reduce monthly ticket for public transport (9€-Ticket) that was valid throughout the entire country from July to September 2022.

Public transport fare reduction

Short term response

Possible funding sources

- Federal funds
- Regional funds
- Municipal funds



Intentions

- Alleviation of costs on citizens
- Accessibility
- Incentivise use of public transport and promotion of sustainability

Cost-benefit calculation

- Trade-off between the costs and the respective benefits
- Possible creation of market imbalances
- Assessment of a long term strategic goal

Political and social impact

- Politically induced relief effects, without targeting to needs
- Analysis of purchasing and consumption behaviour
- Consideration of new public transport ticket models

The 9-€-ticket had only a marginal impact on the modal split in Germany, because a fossil fuel discount was introduced at the same time

9-euro-ticket

- The strongly subsidized ticket was characterized by flexibility and simplicity. It could be purchased easily and was valid throughout Germany on urban public transport. The main purpose was to reduce the cost burden.

- The introduction of the 9-euro ticket in Germany was accompanied by more intensive use of public transport, especially in urban areas.

- The 9-euro-ticket was primarily used for everyday trips. In contrast to the plan, the impact on the modal split for commuters was rather marginal.

- The measure could not unfold its full effect because a discount for fossil fuels has been introduced at the same time, creating the opposite incentive for the use of private transport. Price discounts should prioritize sustainable transport modes, not broadly prioritize “everything at the same time”.

- However, the subsidies required substantial resources which are now lacking to improve and expand the public transport offer, in particular in rural regions. The effect may therefore be counterproductive for the quality of public transport and should be combined with an improved offer and a prioritisation of public transport.

Further Information: 9-Euro-Ticket June VGN

General fuel discount

Short term response

Goal	Temporal prevention of a cyclical downturn in the economy in crisis situations
Stakeholder	National government
Precondition	Financial resources for subsidies

Measure description

- A fuel discount is a reduction in the price of gasoline or other types of fuel that is directly or indirectly subsidised by the government. This type of discount is typically designed to provide relief to consumers who are facing high fuel prices due to market factors such as increased demand, supply disruptions or geopolitical tensions. National governments may use a variety of mechanisms to implement fuel discounts, such as reducing or eliminating taxes on fuel, offering direct subsidies to fuel providers, or implementing price caps on fuel.

Measure elements and process steps

- Analysis of fuel market conditions to determine the need for fuel discount
- Design scope, duration and implementation mechanism of fuel discount and allocate budget
- Implementation of subsidies, including communication to fuel providers and consumers
- Monitoring and adjustment according to fuel prices and consumer behaviour

Example

- To mitigate the steep rise in fossil fuel prices in France the French government introduced a fuel discount of 30 cents, which was displayed directly to customers on the fuel price.

General fuel discounts eliminate the signal effect of prices and are not targeted to groups with highest needs. Therefore mobility budgets to consumers in need or discounts for specific groups such as transport operators or logistics companies should be considered as an alternative.

General fuel discount

Effect
- Cushioning the financial impact of fossil fuel price increases
- Eliminating the signalling effect of prices indicating scarcity

Beneficiary
- End consumers
  - Commuters
  - Logics operators
  - Commerce

Realization possibilities
- Price control
- Tax reduction for fossil fuel
- Relief payments

Impacts
- Increased usage of transportation options due to the discount
- Short-term infrastructure burden, due to the favourable incentive system
- Price intervention is perceived as relief by commuters and drivers

Further Information: Ifo (2022) Link, BMF (2022) Link

6. Long term prevention

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* The interview partners did not necessarily implement the respective measures themselves and in some cases, the effectiveness of the measures was also critically questioned.

Improving the availability of fossil fuels through greater storage capacity

Long term prevention

11

Goal	Decrease dependency on fossil fuel imports and improve ad hoc availability
Stakeholder	National government, urban transport and logistic operator
Precondition	Financial resources for storage

Measure description

- To become less dependent on fossil fuel imports and improve ad hoc availability, expanding fossil fuel storage capacity is a potential solution. By increasing storage capacity, National governments, urban transport and logistic operator can stockpile reserves for extended periods, ensuring a reliable supply of fossil fuels and greater energy security.

Measure elements and process steps

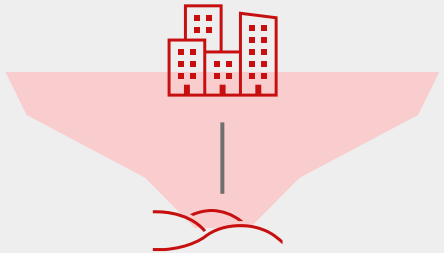
- Capacity assessment to determine the current capacity. In addition, the potential risks and costs associated with storage expansion should be evaluated.
- Based on the capacity assessment, the appropriate storage technology should be selected.
- Risk management strategies should be put in place to ensure the safe and effective operation of fossil fuel storage facilities.

Example

- In response to the oil embargo imposed by the Organization of Petroleum Exporting Countries (OPEC) in the 1970s, the U.S. government initiated the creation of a Strategic Fossil Fuel Reserve. The fossil fuel reserve is stored in salt caverns along the Gulf of Mexico.
- Since 2013 the same stockholding requirements apply across all 28 EU Member States and the IEA member countries, requiring strategic reserves equivalent to 90 days' worth of net imports.

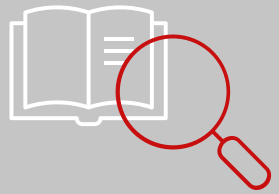
Improving the availability of fossil fuels through greater storage capacity

Long term prevention



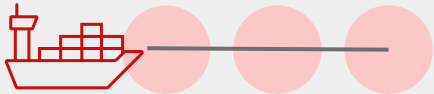
Long-term Storage

- Accessing natural caverns to improve fossil fuel stockpiling
- Imported fossil fuels to be replenished in secure large underground storage facilities
- Expansion of caverns in energy-intensive regions



Expansion and state participation

- A stake in the country's utilities are ensured by investments and subsidy programs of state banks.
- Support programs enable further expansion of storage for essential resources



Short-term Storage

- Expansion of fuel depot for imported fuels
- Share import network stations with neighbouring countries
- Design new discharge ramps

Further Information: Storag Etzel (2023), Link

Electrification of bus fleets

Long term prevention

12

Goal	Reduction of carbon emissions and promotion of sustainable transport
Stakeholder	Public transport operator & municipalities
Precondition	Funding for vehicles and charging infrastructure

Measure description

- With the deployment of e-buses conventional diesel buses can be replaced by powered by batteries or catenaries. The electrification of bus fleets has become a key concern for many cities and countries, as it helps to reduce air pollution and lower operating costs in the long term, as well as independence from fossil fuels.

Measure elements and process steps

- Feasibility Study considering infrastructure requirements, operational costs, energy supply
- Development of project plan with financing, procurement, charging infrastructure, and maintenance requirements
- Procurements of e-busses and installation of charging infrastructure

Example

- Hamburger Hochbahn is changing its bus fleet to e-vehicles until 2030. Approximately 200 e-buses have already been put into operation and reducing 80 tons of CO_2 emissions compared to diesel buses. However, e-busses also crate new dependencies on electricity. Therefore Hochbahn is still reserving diesel busses, to be able to provide services in case of a blackout. Thus, energy supply need to be decentralised and different energy sources should be available.

Electrification of bus fleets

Long term prevention

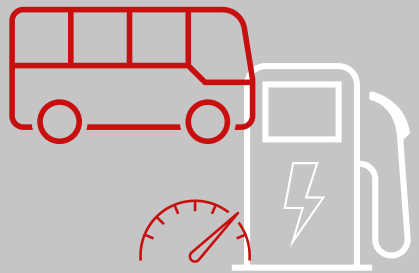
CITY OF THESSALONIKI

Implementation strategy

- Collaboration with bus operators for replacement of diesel busses
- Introduction of e-buses in the city centre
- Revision of the regulations on the implementation

Infrastructure

- Reduction of fossil fuel traffic by introducing low emissions zones



Vision

- Reduce air and noise pollution
- Climate change mitigation
- Decarbonisation

HOCHBAHN

Implementation strategy

- Optimized planning of routes for e-buses due to limited range
- Financial support by national government

Infrastructure

- Building new operating locations with equipment for electric buses
- Solar panels at bus depots
- Electrical grid connection to the charging facilities
- Intermediate charging for buses to increase range

Further Information: HVV (2023), Link; City of Thessaloniki, Link

Energy use optimisation

Long term prevention

13

Goal

Increase energy efficiency and reduce consumption

Stakeholder

Public transport operator

Precondition

Data on energy consumption

Measure description

- To optimise energy use, public transport operators can train their drivers in eco-driving. By driving at a steady speed, avoiding abrupt acceleration or braking, anticipating traffic flow, and maintaining appropriate tire pressure to reduce rolling resistance fuel costs can be reduced. Furthermore, greenhouse gas emissions and air pollution are diminished. In addition energy use can be optimised by proper maintenance, e.g. replacing worn out tires.

Measure elements and process steps

- Development of eco-training concept
- Implementation of drive training and education of drivers
- Monitoring and analysis of data on fuel consumption, driving behaviour and vehicle performance to give drivers feedback
- Revision and improvement of maintenance

Example

- Hamburger Hochbahn is committed to environmentally friendly operations and therefore uses renewable energy to meet its energy needs. Secondly, Hamburger Hochbahn develops energy-saving concepts in cooperation with its employees in order to identify and implement potential savings.

Availability of multiple transport modes and infrastructure

Long term prevention

14

Goal

Redundancy of transport modes to have fallback options in a crisis

Stakeholder

Public transport operator and municipality

Precondition

Vulnerability analysis and funding for new infrastructure and transport modes

Measure description

- The availability of multiple transport modes based on different energy sources, such as trams, metros, and diesel busses increases the resilience of transport systems by providing redundant options with alternatives to switch if one mode is disrupted. In addition, the capacity is increased, passengers are more flexible and the dependency on a single mode is reduced. It is important to also consider adequate infrastructure for active transport modes such as walking and cycling, being independent of energy and fossil fuels and can be expanded at relatively short notice.

Measure elements and process steps

- Evaluation of existing transport modes and infrastructure according to vulnerability and dependencies
- Identification of transport needs and development of transport plan
- Implementation of diversified and resilient transport concept based on multiple modes, giving priority to public transport and active mobility

Example

- The cities of Hamburg, Vienna and Lviv have several transport modes based on different energy sources in place. This parallelism of systems makes it possible to partially compensate for the failure of one mode in a crisis situation. In the city of Lviv, for example, a blackout due to the war resulted in a failure of the tram system. Diesel buses allowed to keep the public transport system operational and partly replaced the tram services.

Reallocation of road space towards public transport and active mobility

long term response

15

Goal

Prioritize sustainable and efficient modes of transportation

Stakeholder

National/ regional government and municipalities

Precondition

Supportive policy framework and funding

Measure description

- Reallocation of road space towards public transport and active mobility involves a paradigm shift in urban planning that prioritises people-centred mobility and sustainable transportation options. This approach requires rethinking the traditional allocation of street space, with a focus on creating a more equitable and accessible transportation network

Measure elements and process steps

- Analysis of existing infrastructure in the geographical area
- Identification of high-priority corridors for reallocation
- Conversion of road space towards public transport and active mobility

Example

- The city of Thessaloniki has created wider and safer sidewalks along major pedestrian corridors to enhance pedestrian accessibility and comfort. Furthermore, the city has implemented a new biking routes along the coast to improve safety and encourage active modes of transportation

Public transport priority schemes

long term response

16

Goal

Improving public transportation efficiency and accessibility

Stakeholder

National/ regional government and municipalities

Precondition

Prioritized transportation plan and policy framework that places public transportation at the forefront

Measure description

- Public transport priority schemes aim to create a more efficient and reliable transit system that benefits passengers and cities. By providing dedicated lanes and priority signals to reduce travel time, improve traffic flow, optimizes energy usage and encourage greater use of public transport.

Measure elements and process steps

- Evaluate the current transportation system to determine where public transport priority schemes would be most effective. Build support by collaborating with urban transport operators and other stakeholders.
- Plan specific actions such as: Dedicated bus lanes, priority traffic signals, and transit-oriented development.
- Identify potential funding sources and secure the necessary resources to implement the program.

Example

- The City of Vienna is committed to prioritising public transport by establishing high-quality bus corridors and separate and secured lanes for public transport in the city centre.

Sustainable Urban Mobility Plans

Long term prevention

17

Goal	Promotion of sustainable mobility modes in urban areas
Stakeholder	Municipalities
Precondition	Alignment with political and social objectives

Measure description

- A sustainable urban mobility plan (SUMP) is a strategic plan that aims to provide a framework for developing and implementing sustainable transportation policies and projects in urban areas. The plan takes into account the social, economic, and environmental aspects of transportation, and seeks to provide accessible, safe, and efficient transportation options that reduce reliance on cars and promote sustainable mobility modes such as public transport, cycling, walking, and shared mobility.

Measure elements and process steps

- Analyse the mobility situation
- Develop a vision and strategy for the urban area with stakeholders
- Develop effective packages of measures
- Implementation of SUMP and regular updating

Example

- In 2014 Thessaloniki initiated the implementation of its SUMP. In an effort to promote sustainable urban mobility during the pandemic, Thessaloniki has implemented temporary bike lanes and has plans to decarbonize its public transportation system by deploying 300 clean buses. Additionally, the city is encouraging multimodality by integrating its bus and metro networks.

Sustainable Urban Mobility Plans

Long term prevention

Vision & Strategy

Discussion of potential development scenarios with stakeholders and citizens

- Gathering of opinions from the public and discussion of potential scenarios
- Creation of a factual basis for further development
- Discussion of current trends and associated opportunities and risks
- Development of scenarios to increase the resilience of the current transportation system.

Consideration of global risks and crises in the development of strategies

Mobility Situation

Information assessment

- Existence of an asymmetrical information situation, due to a lack of transparency
- Prioritization information based on importance and trend reference

Data completeness approach

- Cooperation with internal and external organisations to complete the dataset
- Identification of data needs in terms of political priorities and closing data gaps for the mobility analysis

In addition to the analysis of the mobility situation, risk and scenario analyses are performed

Measure Plan

Selection of measures

- Selection of most promising measure for the local context considering the vision
- Adaption of experience from role model cities and studies

Transparent assessment

- Ensuring efficient use of available resources and avoiding the selection unrealistic measures.
- Analysis and Discussion of potential scenario impacts
- Securing responsibility and a high degree of acceptance of the measures

Develop a specific set of measures to increase resilience in the scope of the SUMP.

Implementation

Appropriate Management

- Creation of responsibility assignment and staff lines
- Guarantee of continuous coordination between all stakeholders
- Ensure transparency of implementation

Procure goods and service

- Realistic compliance and procurement of resources

Monitor progress

- Tracking of achievements and possible optimization potentials

Integration of professionalized holistic crisis management

Further Information: Rupprecht (2019), Link

Parking management and Park & Ride concepts

Long term prevention

Goal	Shifting motorized private transport away from urban city centres
Stakeholder	Municipalities
Precondition	Political will to price parking

Measure description

- Parking management refers to the management, regulation and pricing of parking space in city centres. It includes parking pricing policies that vary depending on the time of day or the duration of parking, parking guidance systems and parking enforcement.
- Park and ride facilities are typically located close to public transport hubs at the outskirts of city and are free or low-cost to encourage their use. The goal is to provide an alternative to driving to congested urban areas for commuters who don't have convenient access to public transport or cannot bike or walk

Measure elements and process steps

- Dimension and regulate the parking space supply
- Develop pricing policy and parking plan
- Install parking meters, reduce/restrict parking facilities in city centres, implement signage and payment
- Establish Park & Ride facilities to better link motorised individual transport with public transport systems
- Ensure enforcement of parking regulations

Example

- Accra's resilience programme includes a Park and Ride strategy for satellite communities and recommended mass transit systems from these points to the CBD. Experience has shown that a lot of people stopped driving and use trotros to come in the city centre.

Under certain circumstances, short-term implementation of park and ride concepts may be viable, for example in the case of fuel rationing combined with restrictions on private transport on main corridors.

Pricing schemes

Long term prevention

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Goal

Influence travel behaviour and encourage the use of more sustainable transport modes

Stakeholder

National government, municipalities

Precondition

Political will and alternative transport options

Measure description

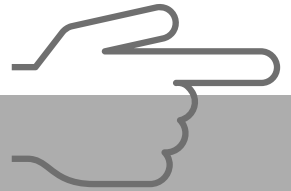
- By increasing the cost of using private vehicles or certain roads, pricing measures such as fossil fuel and emission taxes or road tolls can incentivize individuals and businesses reduce their consumption of fossil fuels and to adopt more sustainable transportation modes. By these measures transport modes which require a lot of public space, consume fossil fuel and contaminate are disincentivized and the generated funds can be used to invest in more resilient and environmentally friendly transport modes.

Measure elements and process steps

- Design of pricing mechanism (Fossil fuel/ emission taxes/ road tolls)
- Establish legal and regulatory framework
- Communication, implementation and enforcement

Example

Stockholm has established a toll border with an area of 30km^2. The goal was to reduce the volume of traffic in the city and to reduce the burden on the environment. The revenue was used to promote and expand public transport. The principle of the toll system considered a higher price in places with high traffic density. The effect of the toll introduction led to the reduction and thus to the fulfilment of the goal.



7. Learnings and recommendations

Self-assessment Checklist: Are you prepared?

1.

Ad hoc crisis management

- ☐ Business Continuity Management is still under development
- ☐ Business functions are prioritised spontaneously in the event of a crisis
- ☐ Crisis Management Framework is still under development
- ☐ Communication channels and responsibilities are set ad hoc
- ☐ Short term measures are prepared spontaneously

2.

Prepared crisis handling

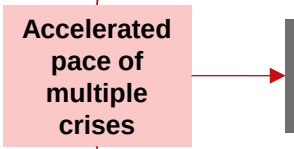
- ☐ A Business Continuity Management is created
- ☐ A Crisis Management Framework is in place
- ☐ Communication channels are set up
- ☐ A steering structure for crisis handling is established
- ☐ Risks and vulnerabilities have been identified and a risk management plan is developed
- ☐ Short term responses have been identified and prepared

3.

Preventive crisis mitigation

- ☐ A Business Continuity Management is in place and revised regularly
- ☐ A Crisis Management Framework is established and continuously improved
- ☐ Risks and vulnerabilities are monitored and evaluated
- ☐ Personnel and financial resources are available
- ☐ Long term prevention measures are taken to mitigate the identified risks
- ☐ Experiences are exchanged with peers and stakeholders
- ☐ Learnings from emergencies and crises are analysed and used for improvement

Learnings and recommendations management of crises in Urban Transport Systems



Identify	To ensure the continuity of the urban transport system in the event of a fossil fuel induced crisis, the **vulnerabilities and risks** of the system must be identified, analysed and ranked by priority.
Organise	Organisations need **dedicated mechanisms** for crisis management. Communication and clear internal responsibilities are key in a crisis situation. Furthermore, it is crucial to be able to react quickly and flexibly to the consequences of the crisis.
Plan and train	To increase the level of preparation for crises, it is advisable to develop **plans and perform regular trainings**. In addition, an ongoing exchange with different stakeholders is valuable to benefit from learnings and integrate them into the crisis management systems.
Colla-borate	Based on **collaborative crisis management** by municipalities, transport operators and public authorities, crises can be addressed holistically.
Build resilience	Urban planning strategies that build resilience trough **redundancy, robustness, flexibility, reflectiveness and integration**, and reduce fossil fuel dependency, may prevent or significantly mitigate crisis consequences for urban transport systems.

Mature crisis management requires upfront investments and enables actors to use resources efficiently, reducing the impact of crises and allowing for more room to maneuver.

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